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PROPAGATION OF VINES

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Vines are propagated by rooting "cuttings" of the "canes." Canes are the mature growth of the current year; cuttings, pieces of these canes, usually from 10 inches to 18 inches long. Cuttings are sometimes planted directly in the vineyard, but are usually first rooted in a nursery.

Choice of Cuttings.—The vines from which the cuttings are to be taken should be examined while they still hold their leaves and fruit, to see that they are healthy and of the variety desired. Vines which have suffered from drought or disease or which have been defoliated by insects or frost before the wood is mature yield poor cuttings. Wood (canes) from young vines which have not yet borne is often immature, and that from vines which have borne excessive crops is often ill-nourished. Cuttings from either are likely to fail or grow poorly.

The best wood for cuttings is of medium size and with moderately short joints. Very short joints indicate disease and very long joints a lack of nourishment or maturity.

The outer bark should be a clear yellow or purple brown, according to the variety, and without dark blotches or immature areas. When the cane is cut with a sharp knife the inner bark should appear green and full of sap, the wood should be hard and free from dark specks or streaks, and the pith of moderate size, clear, firm, and light colored.

Cuttings which do not fill these specifications should not be planted directly in the vineyard. Less perfect cuttings may be planted in the nursery. Some are likely to grow well and will be suitable for vineyard planting the next year.

Time to Make Cuttings.—Cuttings are supposed to be best if made from vines pruned within a week or two after the fall of the leaves, but, if the vines are healthy and the wood well matured, they may be made from vines pruned at any time from the fall of the leaves until a week before the starting of the buds in spring.

It is best to make the cuttings as soon as possible after the vines are pruned; but if the weather is cool the prunings may lie a week or two in the vineyard without injury.

Method of Making Cuttings.—Cuttings of from half an inch to one-third of an inch in diameter are best, and they should not be more than 1 inch at the butt nor less than one quarter inch at the top. The shorter they are the better, providing they can be made to root. In good nursery soil with special care cuttings of 8 inches do very well. Usually 10 to 12 inches is better. For direct planting in the vineyard they should be from 15 to 18 inches. The looser and drier the soil

and the hotter the climate the longer they should be. In wet heavy soil in the cooler regions short cuttings are preferable.

Kind of Cuttings.—Cuttings may be made from any part of the vine if they fill the specifications already given. In some cases only one cutting can be made from one cane; in others, three, four, or more. There seems to be no reason to avoid suckers and watersprouts if they are of the proper quality. Laterals, if large and well matured, make excellent cuttings and are often preferable in long-jointed varieties, like Sultanina.

The base of the cutting should be as close as possible to a bud, providing the diaphragm or cross partition is left. If a pithy piece of wood is left at the base the cutting does not heal over when it roots and is apt to decay. At the top of the cutting about three-quarters of an inch of internode should be left above the uppermost bud.

Care of Cuttings.—If the cuttings are made in planting time they should be planted as soon as made, with care to prevent drying. If, as is more usual, they are made several weeks or months before planting, their success depends very much on the way they are handled in the meanwhile.

The amount of growth that a cutting will make the first year depends on the kind of soil it is planted in, the regularity and sufficiency of the water supply, and the temperature and length of the growing season. A properly handled cutting in suitable soil in the Imperial Valley will make as much growth in the first season as a similar cutting equally well handled in a cool locality will make in three seasons.

In order to utilize the growing season to the full in any region, the cuttings should start to grow as early as they are reasonably safe from frost or prolonged cold wet weather.

The chief danger in the cooler regions is planting too early. Several weeks of cold wet weather may cause them to rot in the ground, especially in low places or in heavy soils. Under such conditions April is perhaps the best month for planting. In the hottest regions the chief danger is the drying of the cuttings before they root, or sunburn of the young growth before the roots are sufficiently developed to supply water. In these conditions January or February are perhaps the best months for planting. In any case, it is important that the roots shall start as soon as or sooner than the leaves, and the cuttings should be handled with this object in view.

Heat and water are necessary to start either roots or buds. We can delay either by keeping the cuttings dry and cool or hasten either by keeping them moist and warm. Too much heat may cause the cuttings to decay. There is little danger from cold, even freezing, if the cuttings are mature. Too much water will cause rapid decay, especially at high temperatures. Dryness is less dangerous, especially at low temperatures.

In view of these facts, the best way of handling the cuttings before planting seems to be to bury them in moderately dry sand in a cool place until about two to three weeks before planting, then to moisten the sand, and increase its temperature until planting commences.

A good way to do this is to place a pile of sand in a sunny place early in the season while dry sand can be obtained. The pile should

be protected from surface water by means of a shallow surrounding trench. The moisture can be controlled by sprinkling if necessary or by covering with boards or canvas in case of too much rain.

The cuttings, as soon as made, are put up in bundles of 100 to 200, well tied and with the *butts all level*. These bundles are then buried carefully and regularly in the sand pile with the *butts up* and all at the same level. Sand should be packed in between the bundles and as much as possible between the cuttings in the bundles. Between 3 and 4 inches of sand should then be placed over the butts of the cuttings, making a perfectly level bed.

To protect the cuttings from moisture and heat and so to keep them dormant the sand should then be well covered with 12 to 18 inches of straw, chaff, or similar material.

About two or three weeks before planting is to commence the straw covering should be removed and the 4-inch top layer of sand thoroughly moistened by sprinkling. The moisture and the heat from the sun will then start the process of root formation. The sand must be closely watched and sprinkled as often as is necessary to prevent drying, only enough water being used to moisten the top layer of sand. The drier the tops of the cuttings, which are at the bottom of the sand pile, the longer they will remain dormant.

After seven to ten days the butts of the cuttings should be examined every few days. As soon as they show signs of white healing tissue (callus) and checking of the joint where the roots are forming they are ready to plant. Planting should not be delayed until roots appear, as these roots will be destroyed in planting and others will have to form.

When planting extends over several weeks, the removal of the sand layer should be gradual and at the same rate as the planting will take place so that the cuttings when planted will all be in the proper condition.

This method is excellent and results in a large percentage of rooted vines and large growth. It is also dangerous because unless carefully and skillfully carried out the cuttings may be injured and not grow at all.

Unless there is certainty of the method being properly carried out it is best simply to bury the cuttings in moderately dry sand in a cool place protected from sun and rain. A cellar, shed, or other shady place is suitable.

Planting Cuttings.—The cuttings may be planted in the nursery by means of spades and shovels, assisted sometimes by the use of a plow or other means, according to the character of the soil, the number of cuttings to plant, and the means available. The mechanical details will vary in each case. In all cases, however, certain conditions must be observed to get the best results.

The soil should be fairly rich. The texture is not of great importance, though excessively sandy or very heavy soils are not suitable. The soil should be well plowed or subsoiled to a depth of at least 12 inches, unless naturally open and loose. It should be well graded so that it can be easily and regularly irrigated.

If the cuttings have been callused in the way described, they should be removed from the sand just before planting and carefully protected

from drying by being placed in planting cans or boxes and covered with wet sacks. They should not be exposed to the sun or dry air for more than a few minutes, even when planting.

If the cuttings have been kept in dry sand, they should be placed in water for 24 to 48 hours before planting. This is best done by placing them in five-gallon oil cans filled with water, where they should remain until taken to the field for planting.

They should be planted with the second bud level with the ground, that is, with one full joint above the surface. A line or long batten should be used to insure the row being straight. This much simplifies cultivation and hoeing. The soil should be firmed around the butts and unless quite moist settled with water when the trench is about three-fourths full. The soil should then be brought up around the cuttings almost to the top bud by hand or a suitable implement so that each row of cuttings is in the middle of a slight ridge. This facilitates irrigation.

If water has been run in while planting, no irrigation will be needed for about two weeks. Otherwise the nursery should be irrigated within a day or two after planting. Subsequent irrigation will depend on the soil and the climate, but it should be relatively frequent during the first part of the season so as to start growth early and to keep it going until the vines have made a top growth of 12 or more inches and have developed a good root system that will make them less sensitive to drying out.

Irrigation should stop early enough to prevent late growth. About the beginning or middle of September the tips should cease to make new growth and the canes should commence to show the brown of mature wood at the base. Usually no irrigation should be given after the last days of August.

Digging and Care of Rooted Vines.—The vines may be dug as soon as they have dropped their leaves or may be left in the ground until they are needed for planting. The ground should be moist down to the roots, but not wet when the vines are dug. All that are fit to plant should be sorted into two classes, number 1 and number 2. Number 1 vines are those which have made a well ripened top growth of at least 6 inches, have healthy roots of at least one-eighth inch diameter at the bottom, and show no dead areas or mechanical injuries on the part of the vine that represents the original cutting. Number 2 vines are those having a smaller growth but well matured wood and no serious defects. Vines showing black knot, nematodes, serious mechanical injuries, or little or no mature wood or roots should be rejected.

The roots are tied up in bundles of 50 to 100, according to size, and the tops and roots shortened with a broad axe to 4 or 5 inches after tying. Each bundle should be furnished with a good label showing variety, number, and grade. They should not be exposed much to the sun and should be buried in moist sand the day they are dug. If they are to be kept long they should be buried in a shady place or shed. They should be kept as cool as possible until planted and should be planted before buds or roots have started to swell or to grow.

In hauling or shipping they should be well protected from drying by means of wet sacks or wet straw if left out of the ground for more than two days.